Descriptions

MAX20331AEWLT is over voltage protection IC designed to protect the audio codecs and electronics of portable devices. Connecting the MAX20331AEWLT between the 3.5mm jack and audio path electronics provides protection against high-voltage conditions to ±35V. The 9-Ball Wafer Level Chip Scale Package (CSP) 1.2mm x 1.2mm with Pb-free and Halogen-free, makes it ideal for mobile device. High Performance Pin-to-Pin Replaceable MAX20331, CSP-9(WLP-9(1.2x1.2).

Order Information

Package		Part Number	Top-Side Marking
CSP-9(WLP-9(1.2x1.2)	Tape and Reel	MAX20331AEWLT	TBD

Features

- Pin-to-Pin MAX20331AEWL, CSP-9(WLP-9(1.2x1.2)
- Wide VCC Supply Range: 2.3V~5.0V
- Protects Devices from High-Voltage Conditions: ±35V Tolerant Inputs
- OVP Threshold: ±4.1V
- High Input/Output Swing >2.5V rms, Superior SNR >130dBA.
- Ultra-Low THD+N: -106dB, 32Ω Load; -112dB, 600Ω Load; -120dB, 100kΩ Load
- Audio Path Pop & Click Elimination

Applications

- 4G/5G Smart Phone, Tablets and Mobile Device with 3.5mm Audio Jack
- Bluetooth/Intelligent Speaker

Typical Application Circuit

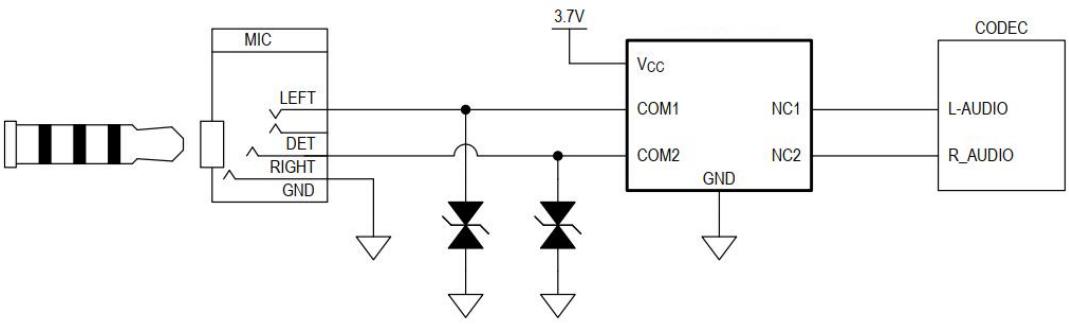


Fig.1 Typical Application Circuit

Functional Diagram

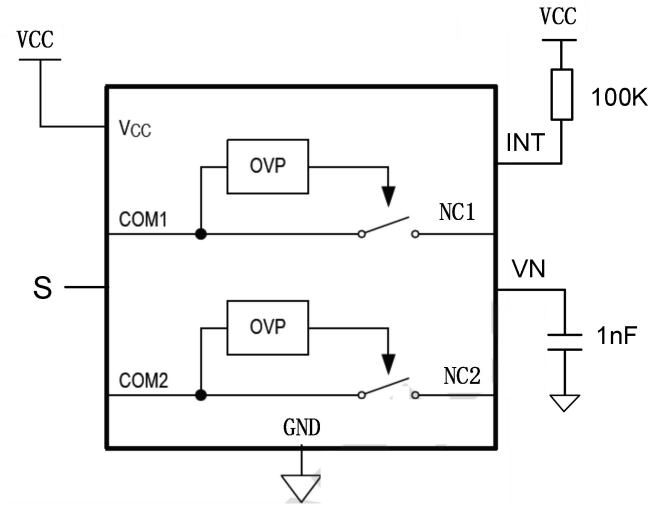
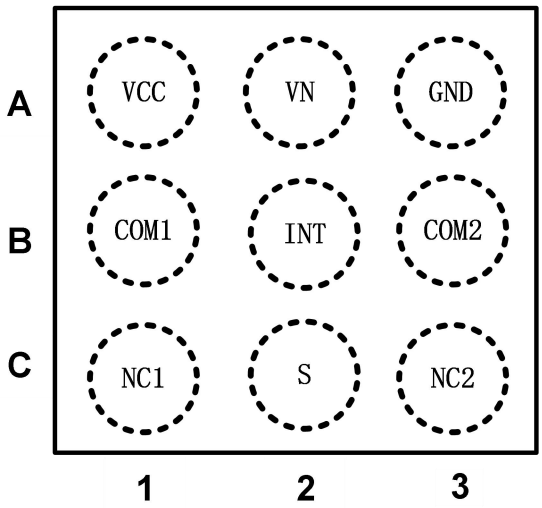


Fig.2 Functional Diagram

Pin Configuration



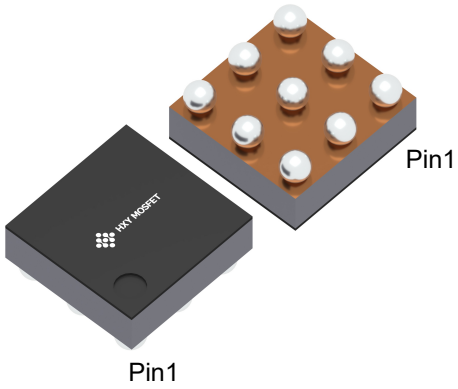


Fig.3 Top-Through View Pin Configuration

Pin Descriptions

Pin #	Name	Type	Description
A1	VCC	PWR	1.65~5.5V Positive Supply. Bypass VCC to GND 0.1uF decoupling capacitor ACAP
A2	VN	GND	1nF Capacitor Connection to GND as close as possible
A3	GND	GND	Primary Ground Connection
B1	COM1	I/O	External Audio Line 1. Connect to external audio jack
B2	INT	I/O	Open Drain Interrupt Output when COMx reach OVP threshold
B3	COM2	I/O	External Audio Line 2. Connect to external audio jack
C1	NC1	I/O	Protected Audio Line 1. Connect to internal audio codec
C2	S	I/O	GPIO control. When S is low, NCx connect to COMx; When S is high, disconnection
C3	NC2	I/O	Protected Audio Line 2. Connect to internal audio codec

Table-1 Pin Descriptions

Absolute Maximum Ratings over operating free-air temperature range (unless otherwise noted) **(1)**

		Range	Unit
Power Supply Voltage	VCC	-0.5 ~ 6.0	V
Common Ports Voltage	V_{COM}	±35	V
Internal Ports Voltage	V_{NC}	±6	V
VN Voltage	V_{VN}	-35 ~ +0.5	V
Continuous Current into Device	I_{DC}	750	mA
Storage Temperature Range	T_{STG}	-55 ~ 150	ºC
ESD HBM, ANSI/ESDA/JEDEC JS-001-2012	VCC	±2	kV
	COMx	±2	kV
	Other I/O Pins	±2	kV
ESD MM, JESD22-A115	VCC	±200	V
	COMx	±2	kV
	Other I/O Pins	±2	kV

Table-2 Absolute Maximum Ratings

(1) Stresses beyond those listed in Table-2 *Absolute Maximum Ratings* may cause permanent damage to the device. They are stress ratings only, which do not imply functional operation of the device at these or any other conditions. Beyond those indicated under *Recommended Operating Conditions*, exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommend Operating Conditions

		Range	Unit
Power Supply Voltage	VCC	2.3 ~ 5.5	V
Common Ports Voltage	V_{COM}	±5	V
Internal Ports Voltage	V_{NC}	±3.5	V
Operating Temperature	T_A	-40 ~ 85	ºC

Table-3 Recommend Operating Conditions

Electrical Characteristics (Ta=25°C, VCC=3.3V unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply						
Supply Voltage Range	V_{CC}		2.3	3.3	5.0	V
Supply Current	I_{CC}	S=1 disconnection		50		uA
		S=0 connnection		160		uA
Digital Input Contol						
S control input logic high	V_{IH}		1.6		5.5	V
S control input logic low	V_{IL}		-0.1		0.5	V
S Internal pull-down resistor	R_{PD}			2		MΩ
Switch On Resistance And Signal Range						
On-Resistance	R_{AUDIO}	V_{IS}= -3.0V~+3.0V I_{OUT}=30mA		0.6	1.1	Ω
R_{ON} Flatness(1)	R_{FLAT}	V_{IS}= -3.0V~+3.0V I_{OUT}=30mA		0.001	0.005	Ω
R_{ON} Matching Between Channels(2)	ΔR_{ON}	V_{IS}= -3.0V~+3.0V I_{OUT}=30mA		0.02	0.05	Ω
Effective Signal Range	V_{IS}	THD+N < 0.1% @R_L=600Ω			2.5	Vrms
Switch Dynamics						
Total Harmonic Distortion	THD+N	f=10Hz to 20KHz V_{IS}=2Vrms @R_L=600Ω		-112		dB
		f=10Hz to 20kHz V_{IS}=1Vrms @RL=32Ω		-106		dB
Signal-to-Noise Ratio	SNR	f=10Hz to 20KHz, Inputs grounded @R_L=32Ω	130			dBrA
OFF Isolation	OIRR	f=10Hz to 20KHz, V_{IS}= 1Vrms @R_L=32Ω		-100		dB
Crosstalk (3) (Channel-to-Channel)	ACRX	f=10Hz to 20KHz, V_{IS} = 1Vrms @R_L=32Ω Source Impedance=0Ω		-100		dB
Power Supply Ripple Rejection	PSRR	f=20KHz, V_{IS} = 0.316Vrms @R_L=32Ω		-100		dB
-3dB Bandwidth	BW	@R_L=50Ω		80		MHz
Turn-on Time	t_{ON}	V_{IS}= ±100mV @R_L=32Ω S switches from High to Low		50		mS
Turn-off Time	t_{OFF}	V_{IS}= ±100mV @R_L=32Ω S switches from Low to High		15		mS
Positive Over Voltage Protection						
Positive OVP Lockout Threshold	$V_{POS-OVP}$	V_{COM} Rising Edge		4.1		V
Positive OVP Hysteresis	$V_{POS-HYS}$	V_{COM} Falling Edge		300		mV

Positive OVP Response Time	t_{FP}	V_{COM} =1V to 6 step @R_{NC}=1KΩ		0.6		uS
Positive OVP Recovery Time	t_{FPR}	V_{COM} =6V to 1 step @R_{NC}=1KΩ		130		uS
Positive OVP Leakage Current	$I_{POS-OVP}$	V_{COM} =+35V @R_{NC}=1KΩ		66	90	uA
Negative Over Voltage Protection						
Negative OVP Lockout Threshold	$V_{NEG-OVP}$	V_{COM} Falling Edge		-4.1		V
Negative OVP Hysteresis	$V_{NEG-HYS}$	V_{COM} Rising Edge		600		mV
Negative OVP Response Time	t_{FN}	V_{COM} =-1V to -6 step @R_{NC}=1KΩ		0.6		uS
Negative OVP Recovery Time	t_{FNR}	V_{COM} =-6V to -1 step @R_{NC}=1KΩ		150		uS
Negative OVP Leakage Current	$I_{NEG-OVP}$	V_{COM} =-35V @R_{NC}=1KΩ		100	140	uA
Thermal Protection						
Thermal Shutdown	T_{SHDN}			150		°C
Thermal Hysteresis	T_{HYST}			20		°C

Table-4 Electrical Characteristics

Note:

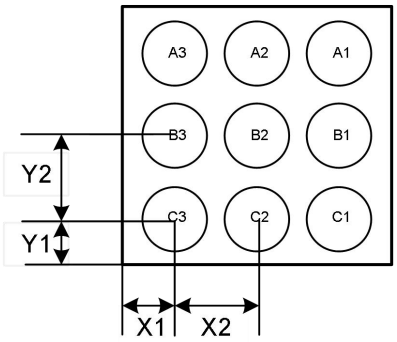
(1) Flatness is defined as the difference between maximum and minimum value of ON-resistance at the specified analog signal voltage points.

(2) R_{ON} matching between channels is calculated by subtracting the channel with the lowest max Ron value from the channel with the highest max Ron value.

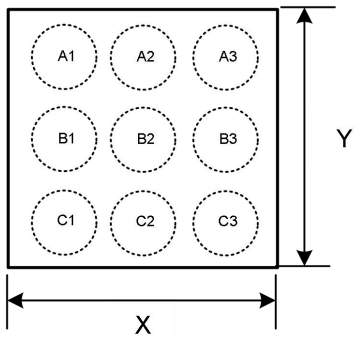
(3) Crosstalk is inversely proportional to source impedance

Package Outline Dimensions

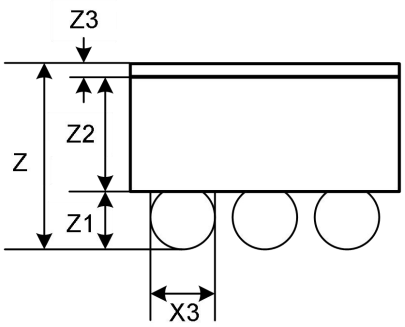
CSP-9(WLP-9(1.2x1.2)



Bottom-Up View



Top-Through View



Side View

Fig.4 Package Outline Dimensions

Symbol	Dimensions In Millimeter		
	Min.	Typ.	Max.
X	1.14	1.17	1.2
Y	1.14	1.17	1.2
X1		0.18	
X2		0.40	
X3	0.21	0.23	0.25
Y1		0.18	
Y2		0.40	
Z	0.545	0.575	0.605
Z1	0.165	0.185	0.205
Z2	0.3525	0.365	0.3775
Z3	0.02	0.025	0.03

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